

RESEARCH DEPARTMENT

**NEW BAND I TRANSMITTING AERIAL
FOR THE PONTOP PIKE TELEVISION STATION**

Technological Report No. E-114/8
(1965/25)

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for Head of Research Department

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INTRODUCTION

To permit the radiation of the second BBC television programme (BBC-2) at u.h.f. from a topmast at Pontop Pike the original cantilever Band I aerial has been replaced by a new aerial mounted on the support mast. The changeover was made on 14th May 1965.

SUMMARY OF INSTALLATION

- Site: The site is 10 miles (16 km) south-west of Newcastle-on-Tyne, grid reference NZ/148526, height 1,002 ft (306 m) a.m.s.l.
- Support Structure: The support structure consists of a 438 ft (133 m) square-section stayed mast having a side dimension of 4 ft (1.22 m). The stays are attached to the mast corners and the mast orientation is such that one stay is on a bearing of 83° ETN.
- General Arrangement: See Fig. 1.
- Channel: Channel 5, with horizontal polarization is used. The vision carrier is offset -6.75 kc/s and the sound carrier -20 kc/s.
- Aerial: The aerial¹ is a replica of that in use at Peterborough; it consists of eight tiers of radial unipoles mounted on a 6 ft 6 in (1.98 m) diameter conducting cylinder. The inter-tier spacing is 0.44λ and the mean height 391 ft (119 m) a.g.l. Each tier has six unipoles spaced equally round the cylinder, one unipole being on a bearing of 8° ETN. The unipoles are driven with equal currents fed in phase rotation. There are independent main feeders to each four-tier half-aerial.
- Power: A single 5 kW transmitter is used.

Templet and Horizontal
Radiation Pattern
(h.r.p.):

See Figs. 2 and 3. The new aerial was required to maintain the existing service area; the desired minimum effective radiated power (e.r.p.) shown on the templet in Fig. 2 therefore corresponds to the h.r.p. of the original superturnstile aerial but with the e.r.p. increased by 1 dB to compensate for the lower height of the new aerial.

In the design stage it was thought that the radiating elements of the Peterborough aerial were $\lambda/4$ unipoles, as originally planned. Fig. 2 shows the theoretical h.r.p. of such an arrangement (the form is such that the h.r.p. can be calculated accurately). It was therefore expected that the field provided by the new aerial would not be less than that of the old aerial in any direction.

Comparison measurements of the field provided by the old and new aerials showed, however, that although the mean fields were substantially the same, there were differences of up to about +2 dB, -5 dB, depending on direction. Upon investigation it was discovered that, during the development of the Peterborough aerial it had been found necessary for impedance-matching purposes, to increase the length of the unipoles to 0.385λ (at vision carrier frequency), the same arrangement being repeated at Pontop Pike. The theoretical h.r.p. for this arrangement is shown in Fig. 3.

Further study of the comparison measurements suggested that an additional effect was contributing to the observed differences between the old and new aerials. If it is assumed that there was an error of about 20° in the relative phasing of the two planes of the old aerial, reasonably close agreement is obtained between the predicted and measured comparisons of the two aerials. The h.r.p. for this case is shown in Fig. 3. Fig. 3 may therefore be regarded as representative of the performance of the old and new aerials.

Gain:	Mean intrinsic gain	6.4 dB
	<u>Deduct:</u> losses due to distribution feeders and possible misalignment	<u>0.1 dB</u>
	Mean net gain	6.3 dB
	<u>Deduct:</u> loss in main feeder (type HM7)	0.9 dB
	network loss	<u>0.1 dB</u> <u>1.0 dB</u>
	Mean effective gain	<u>5.3 dB</u>

Programme Link:

The programme is obtained by a G.P.O. s.h.f. link.

REFERENCE

1. Detailed information on the construction and dimensions of the aerial is given on drawings held by BBC Planning and Installation Department as follows:

9A/D/88579 General Arrangement of Aerial

9A/C/88944 General Assembly of Unipole

CHS

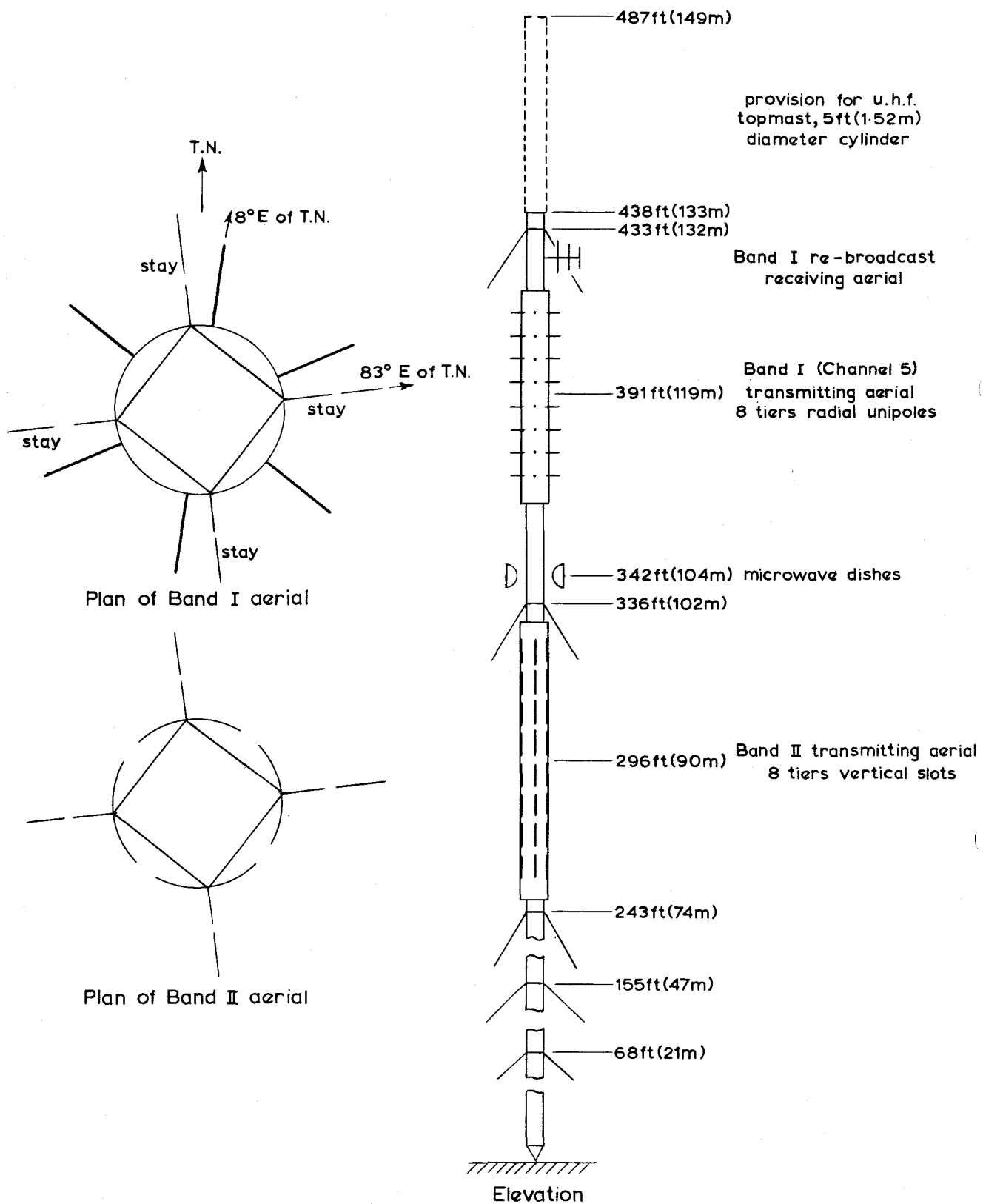


Fig. 1 General arrangement of aërials on mast

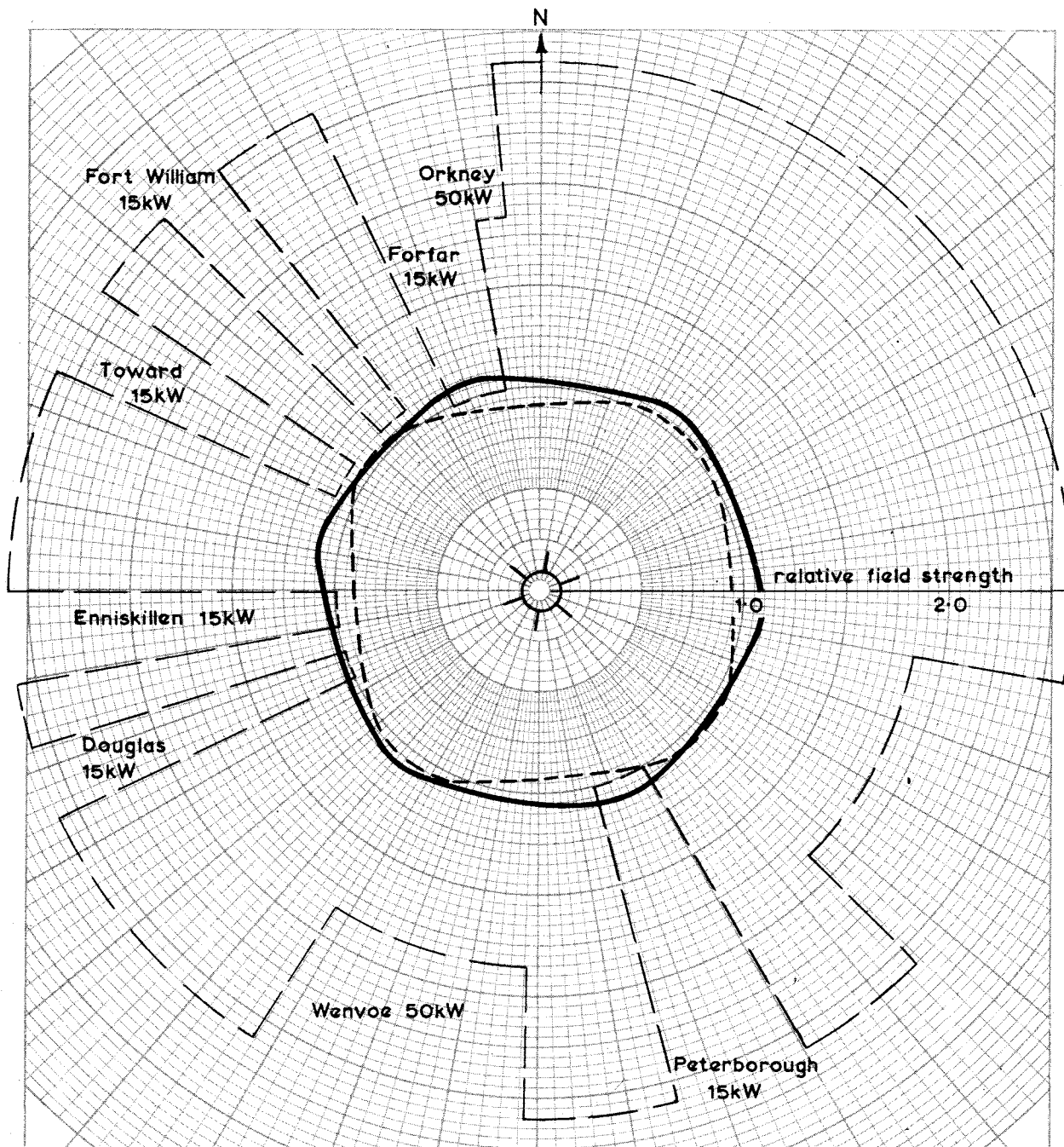


Fig. 2 Templet and horizontal radiation pattern

HORIZONTAL POLARIZATION

Channel 5 (Vision carrier 66.75Mc/s, Sound carrier 63.75Mc/s)

Mean effective gain 5.3dB

Transmitter power 5kW

Mean E.R.P. 17kW

———— Maximum permissible E.R.P.
 - - - - - Minimum desirable E.R.P. (H.R.P. of idealized old aerial)
 ———— H.R.P. of new aerial, calculated for 0.25λ unipoles.

Unit field corresponds to an E.R.P. of 15kW

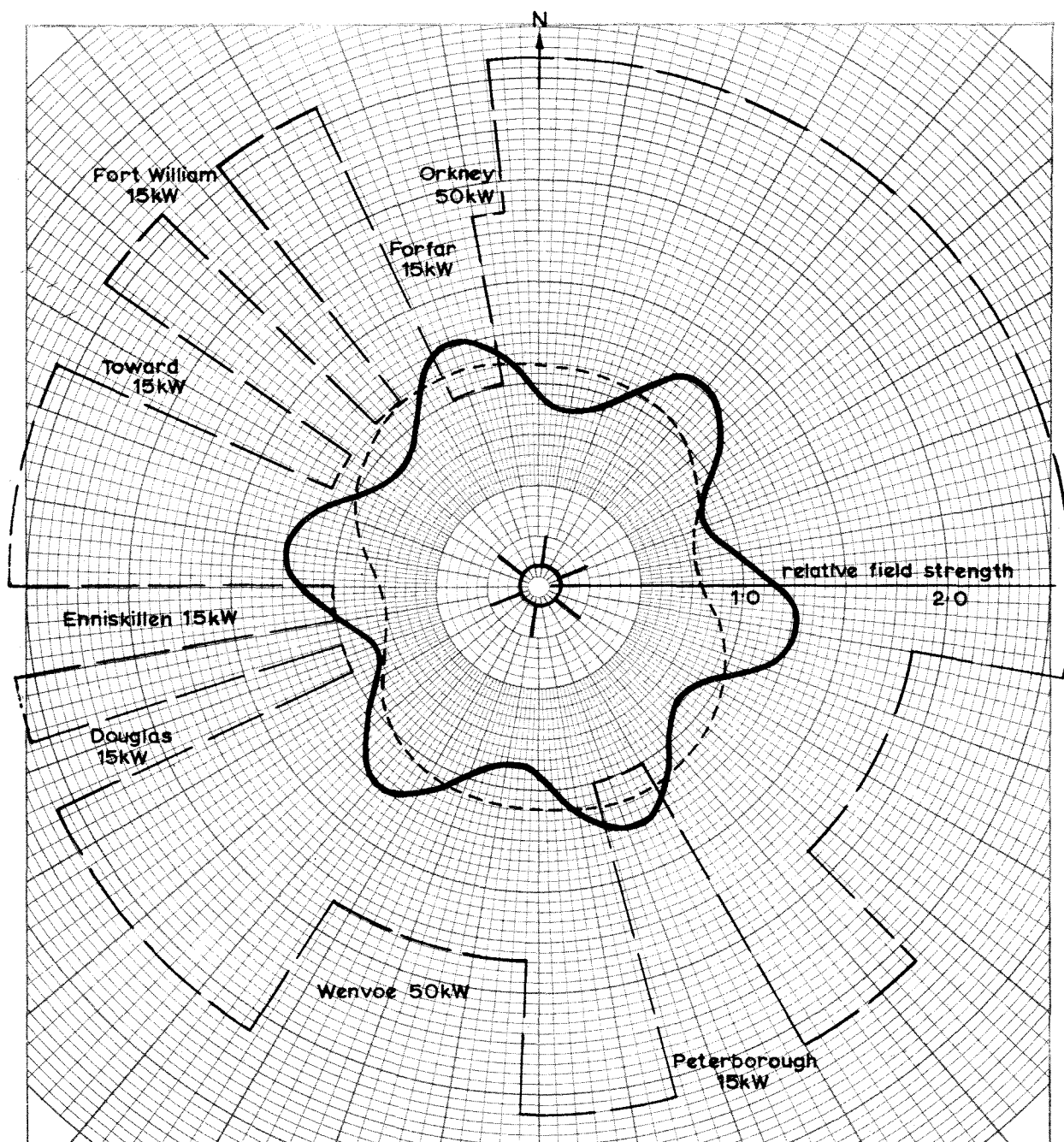


**Fig 3. Templet and revised horizontal radiation pattern-
HORIZONTAL POLARIZATION**

Channel 5 (Vision carrier 66.75Mc/s, Sound carrier 63.75Mc/s)

Mean effective gain 5.3dB
Transmitter power 5kW
Mean E.R.P. 17kW

————— Maximum permissible E.R.P.
----- Minimum desirable E.R.P. (H.R.P. of
actual old aerial)
————— H.R.P. of new aerial, calculated
for 0.385λ unipoles.

Unit field corresponds to an E.R.P. of 15kW